



Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

PAPERS
IN
CHEMISTRY.

The LESSER GOLD MEDAL of the Society was this Session voted to THOMAS WHITE, Esq. of Woodlands, Durham, for his application of Larch Bark, to answer all the purposes of Oak Bark, in Tanning Leather. The following Communications were received from him, and the several Specimens of Leather, so tanned, are preserved in the Society's Repository.

SIR,

IN the year 1786, my deceased father did himself the honour of laying before the Society of Arts, &c. his remarks on the improvement of this place; and in a second letter, in 1796, he wrote some further observations; since which time, the plantations, as well as the place in general, have made great progress in beauty and improvement,

ment, which induces me to trouble you with a few ideas, that I flatter myself will be of importance to the country at large, as well as of private benefit to persons in possession of woods, which you will oblige me by laying before the Society.

As the trees have now advanced, as I have before observed, to a considerable size, we have been busy for some years in weeding them out to a timber distance; in doing which, lately, and whilst taking off the bark of some larch trees that were wanted for building purposes, our agent observed the nails of his fingers to be stained, which induced him to think, that the bark of this tree might be useful in tanning leather, a thought that struck the active mind of my father many years ago, when he was desirous of trying its virtues in this necessary and useful business, but was prevailed upon to give up the project, on being told, that a tree containing turpentine would not answer the purpose, his advisers thinking the larch was a species of the fir tribe, instead of the cedar. In consequence of this renovated idea, I was determined to have the most impartial trial made of the bark of the oak, and that of the larch, and in order to shew the latter no favour, I procured some of the best oak bark in the country, such as can rarely be purchased, and took that of the larch from a small young tree. I next purchased two calf skins, of the same value, weight, and quality, and put as much of the fine oak bark to one skin, as was applied of the larch bark to the other, both remaining in the pits the same time. During the operation, as we repeatedly weighed a certain measure of larch liquor against the oak, the latter always required an additional quantity to make the scales equal, which accounts for the skin tanned
by

by larch being above one pound and a quarter heavier than the other, which it was when dried and ready for the currier, the increase being gradually perceptible during the whole business. Which of the two skins proved the best, I leave to the Society to determine, but I flatter myself that, exclusive of the additional weight of that produced from larch, the colour of it is preferable for gloves, saddles, boots, &c.

As I am proceeding with some other experiments, one of them will, I hope, prove which of the two infusions that the skins were tanned in, will afford the greatest weight of leather, in order to produce a fair test of the intrinsic value of both trees, when applied to tanning; the result of which I shall do myself the honour of laying before the Society at a future period.

It must be observed, that the bark of oak and birch, (the two kinds used to any extent), can only be taken off the trees for a very few weeks; whereas larch bark may be collected at any period during three parts of the year; and, I believe, with almost as good effect even in winter; and as the bark is stript off this tree with very little trouble, the expense of doing it is much less than the oak. It is unnecessary for me to inform the Society, that as oak is daily decreasing in this country, so as to require a great annual importation, the larch trees (which I believe there is little doubt of being the cedar of Lebanon) is in a fair way to be as celebrated hereafter, as it was in former times.

In my professional exertions of laying out grounds, and planting by contract, I am constantly regretting the mischief done to woods, by the want of thinning them, which some of my employers tell me they neglect doing,
from

from the difficulty of finding sale for the weedings, which the probable source of consumption for the larch bark, will, I hope, entirely do away, and that this valuable species of tree, by being left at proper distances, will arrive at such perfection, as to be fit for most purposes, if not all, that oak is applied to, viz. in ship-building, &c.

It is my intention (if my professional pursuits will admit) to publish a small treatise on the Management of Woods, in general, collected from the practice of my late worthy father and myself, that I hope will be found useful.

I have sent, from Durham, by the mail coach, directed to you, in a paper parcel, the two skins, with specimens of the oak and larch barks, used in the process of tanning them; and also the Currier's letter who dressed the skins, which, however, he does not think is to be laid before you.

I am, Sir,

Your most obedient

Humble Servant,

THOMAS WHITE.

Woodlands, August 13th, 1811.

TO C. TAYLOR, M.D. SEC.

CERTIFICATES.

SIR,

I AM convinced that the trial of the larch bark will bear the most minute inspection, and will answer all the purposes as a substitute for oak bark. The process of curing

curing is in general ten or twelve days, and these specimens were done in twenty-four hours.

I am,
Your's respectfully,

THOMAS GRAHAM,
Currier.

Hexham, August 6th, 1841.

TO MR. WHITE.

THE Honourable Sir JAMES STEUART, of Courtness, called at the Society's House to give testimony in favour of Mr. White's method of using larch bark, for tanning; he had sent one ton of the bark to Mr. Halden, tanner, at Hamilton, whose report is much in its favour, the operation being performed in less time than when done with oak bark, and better in colour, quality and weight.

SIR,

I AM sorry that I have not been able to send before, two pieces of leather, of a strong quality, tanned with larch bark, and which, though perfectly useful for most purposes, would have continued to great advantage some time longer in the tan-pit for making soles of shoes.

With the specimens, I send a pair of gloves, and a remnant of leather, converted into shoes, both tanned with larch bark, by a person at Hexham, who told me that glovers would use nothing else, could they get a sufficient supply.

In addition to the equality that larch bark is upon with oak, in regard to its tanning as great weight of leather of every description, it has the advantage of being *quicker* in its operation, and from its light colour, of being *preferable*,

ferable, as mentioned before, for gloves, book-binding, &c.

It must be observed, that nothing has been introduced into the tan-pit to make leather firmer but bark.

I am, Sir,

Your most obedient Servant,

THOMAS WHITE.

Woodlands, 26th June, 1812.

To C. TAYLOR, M.D. SEC.

P. S. The leather has not been five months in the tan-pit.

SIR,

I AM really ashamed to give you any unnecessary trouble, I therefore request that you will excuse this letter.

Since I did myself the honour of sending to you, on the 26th ult. a parcel of leather, by the Charlotte coach, I am informed, that during my absence from home, and after you had done me the favour to request a specimen of strong leather, my tanner, to expedite the work, had applied occasionally warm water, in cold weather, which may have made the leather less firm than it would otherwise have been; the time that it was in the tan-pit, also, did not exceed four months. If you, therefore, think the leather is not sufficient to pass judgment upon, I will, when my strong hides are ready, send you a specimen of much superior quality. Mr. Curwen has just written to me for some leather, to whom I mentioned the disadvantage it laboured under.

After sending you the two first skins, I put a number of others, of equal weight and quality, into each of the two tan-pits, to try which bark would prove superior in
the

the end, and found, on taking out the leather, on the same day, from each pit, although both were equally well tanned, that the larch liquid was the strongest, but did not, as in the first instance, produce much more weight of leather than the oak.

I am, Sir,

Your much obliged humble servant,

THOMAS WHITE.

Woodlands, Durham, July 10th, 1812.

P. S. In your last letter, you request to know the comparative expense betwixt larch and oak barks, in a given number of hides.

I have not yet sold my bark from the larch tree, therefore it is not in my power to answer this question; but as it tans faster, and will probably be at a less price, it certainly will be found an excellent substitute for oak.

SIR,

As I leave home to-morrow, for Scotland, I do myself the honour of writing to inform you, that in a few days will be forwarded another piece of strong leather, such as I use for soles of shoes.

A tanner in this country has produced some very firm leather, with larch bark, by making it undergo the additional process usual for that purpose; but my skins acquire the solidity they possess by the strength of the bark alone.

The longer I try the larch, the better I am pleased with it; and I am certain, that when used in an extensive way, by people that have proper tan-pits, &c. it will increase in reputation very much, and be found far more beneficial

ficial than I have been able, in my limited scale, to prove it.

I am, Sir,

With the greatest respect,

Your most obedient humble servant,

THOMAS WHITE.

Woodlands, Sept. 21st, 1812.

TO C. TAYLOR, M. D. SEC.

P. S. The leather is sent off this day for you, in London.
Nov. 21st, 1812.

SIR,

I AM just favoured with your's, of the 10th inst. and am infinitely obliged by the trouble you have taken about my tanning operations.

I have enclosed a certificate, as strong as I can make it, and shall send Mr. Mackintosh, in the Haymarket, on Tuesday next, a calf-skin, one half tanned with oak, and the other with larch; and a hide the strongest I have at present tanned with larch.

I do not wonder at John Bull's unbelief, but I hope, in a year or two, hundreds will prove my tanner's testimony correct.

With many thanks for your kindness, I have the honour to be,

Sir,

Your much obliged,

and most obedient servant,

THOMAS WHITE.

Woodlands, 16th April, 1813.

TO C. TAYLOR, M. D. SEC.

I, THOMAS

I, THOMAS FARBRIDGE, Tanner, of Woodlands, in the county of Durham, do verify, on oath, before one of his Majesty's Justices of the Peace, that on or about the 21st of June, 1811, I put a calf-skin, weighing, when green, 12lbs, into a tan-pit, to which at different times I applied 43½lbs. of larch bark; and on the said 21st of June, I put another green calf-skin, of the weight of 12lbs. also, into another pit, and in the same manner applied, at different times, 42lbs. of oak bark, and on one and the same day drew both these skins, when tanned, which, when dried, produced as follows: viz. The larch skin 6½lbs., and the oak 5½lbs., both skins undergoing exactly the same process, and the former having neither oak bark, nor any other substance of tanning quality put into the tan-pit, but larch bark. And although the larch liquor had 1½lbs. more bark than the other, it was infinitely stronger; for after the two skins were tanned, I put three sheep skins into each of the pits, and although I drew the three from the larch liquor about twenty-one days before those put into the oak bark, they were in a better state; and, at the end of this second tanning, the larch liquor was the strongest, as I have ever found it to be after every experiment where the weight of leather was equal.

I moreover declare, that the skin which is on the point of going to London, the one half marked oak, and the other larch, was tanned, after being equally divided, one with 43lbs. of larch bark, and the other with an equal weight of oak bark, being put into the tan-pits on the same day, about the 21st of May last, and drawn together about a month ago; and that nothing of a tanning quality was put into the larch-pit, but larch bark alone, and the

H

process

process exactly the same in regard to each half, as in the first experiment.

I moreover declare, that the specimen of hide leather sent to London in November last, as well as the hide now to be sent, although tanned in a pit with a number of others, underwent exactly the same process, without any bark or mixture but pure larch bark, and although no comparison was made betwixt it and oak, I am certain it would have required as much bark of the latter to have produced leather of equal good quality and weight.

THOMAS FARBRIDGE.

Durham, April 17th, 1813.

Sworn before me, at the place and date above written,

EDWARD DAVISON,

One of His Majesty's Justices of the Peace for the
said County.

I, THOMAS WHITE, of Woodlands, in the county of Durham, do verify, on oath, that to the best of my knowledge, what Thomas Farbridge attests is true; and as I have often, daily, and sometimes several times a day, inspected the tanning process, it was almost impossible that any deception could be practised without my discovering it.

THOMAS WHITE.

Durham, April 17th, 1813.

The said Thomas White sworn to the above statement before me,

EDWARD DAVISON.

MR.

* * Mr. WHITE, during the above correspondence with the Society, having informed the Secretary, that his deceased father had been favoured with Nine Gold and Two Silver Medals from them, for planting the trees he is now converting to so valuable a purpose; the Society thought it would render an essential service to the public, to trace the progress of the trees, from the time of their being planted, to that of the application of their bark for tanning; and therefore directed the Secretary to make the necessary inquiries, for that purpose, from Mr. White; in answer to which the following communication was received.



SIR,

Woodlands, Sept. 10th, 1813.

I AM favoured with your's, containing a number of queries, which you request me to answer, by giving an account of the formation and progress of my plantations, at this place; an undertaking I shall enter into with very great pleasure, and be equally glad if the humble production of my pen meets with the approbation of the Society, and is found useful to the public; but I must observe, that, after the correct description given by my late father, in two letters addressed to them, one dated January 31, 1786, which is inserted in their 5th volume; and the other August 30, 1796, it will not be in my power to make a statement of his proceedings without being liable to repetition.

In answer to the first part of your inquiry, I must observe, that the trees, for which he was honoured from the Society with nine Gold and two Silver Medals, were

H 2

not

not planted by themselves, but intermixed, which mode was adopted from an idea, that as different species seek their nourishment at various depths and levels, a greater number could be raised on any given surface of ground, and at the same time afford much more beauty to the eye; which, in my professional employment of laying out grounds, is a principal study. But although these trees have been scattered over the face of the plantations, the better half being composed of resinous kinds, such as larches and firs, this peculiar attention was paid to them, viz. that where the ground promised to suit any particular hard wood tribe, it was consequently planted in greater numbers; but, first from the tyranny of the Scotch firs, and latterly that of the larches, many, where the ground was less favourable for them, have been overpowered, which it was almost impossible to prevent, from the great number planted upon an acre, some at two feet, and others at three; whereas now we find $4\frac{1}{2}$ feet asunder quite near enough.

Notwithstanding the reasons given for planting promiscuously, it is certainly right to consider, in a great measure, what trees are most suitable for sale in the country, as well as the quality of the ground; should the latter not be proper for oaks, which are doubly valuable, in every situation, in most of which, however rich the surface may be, or sheltered by nature, it is necessary to plant larches and firs for nurses, as deciduous trees grow much faster when protected by the foliage of these hardy foresters, which can afterwards be partly or wholly cut away, as may be found most conducive to the interest of the proprietor.

The surface soil, which you enquire about, is in some parts

parts of a sharp sandy nature, and in others rather channelly to the depth of four or five inches, the top inclining to a blacker mould, and the under stratum composed of a grit-stone rock.

Other places are nearly of the same description, only of better quality, and some parts in the low grounds are furnished with a tolerable depth of earth, which the progress of the trees easily points out ; for, on the bare and worst ground, nothing but larches, firs, and birches thrive, and consequently not only these do better on land of the same description, but also here and there others ; whereas, on the last-mentioned soil, oaks, elms, ashes, beeches, &c. have shewn an inclination to grow as luxuriantly as the resinous sorts, and which are protected with the greatest care, and even the larches cut down to make way for them, but as the Scotch firs are almost exterminated, the larches are certainly the prevailing trees in my plantations.

In answer to your question, when the planting operations began here, I think it was about the year 1776, which were completed in a very few years afterwards.

The holes were made with a hollow spade, invented, with many other tools, by my late father, which are thus much sooner done than by the common method, and the trees planted shallow in the ground, deep planting being the bane of great numbers.

Particular attention was also paid to their roots, which if fibrous and vigorous, the fine appearance of the tops were of little consequence, and therefore the heights of the trees were chosen to suit the exposure, as well as quality of the soil. But notwithstanding the length of time that planting has been practised, scarcely one person in ten, in my humble opinion, puts in trees small enough, being

anxious to gratify the eye with a sight of the tops, without considering, that perhaps, if of the hard wood species, they will make little or no progress till cut down, and allowed to spring up again.

So very different were those planted here, that a party of neighbouring people, after visiting the place, and riding through the plantations, began to enquire where they were, never supposing that the little pigmies under their horses' feet were trees, and would raise towering heads to the height they have already attained.

As this plan succeeded so well on my estate at Woodlands, it has been strongly recommended by us to those employers who only took our advice in the decoration of their grounds, but planted for themselves; and in all our planting contracts, the whole of which amount nearly to 5,000 acres, we never deviated from the mode above alluded to, and the rules which I shall mention in some other parts of this letter.

Many reasons are given for planting trees large out of a nursery, but I scarcely ever saw a spot that I thought was not better adapted to a tree of ten, twelve, or eighteen inches high, than above those sizes; there are, however, situations, such as old woods, and very sheltered places, where oaks and some other trees may be used, 3, 4, or even 5 feet high, but such ought to be removed in a nursery two or three times, to create roots equal to the length of lever above, prior to being planted in the places alluded to.

As in exposed situations particularly, the deciduous kinds of forest trees will not get up without the aid of nurses, such as larches and firs; these should be planted smaller than the objects they are to protect, particularly Scotch firs, not only to enable them to bear the winds
that

that may annoy them in the infant years, but also on account of their roots not being so well furnished with fibres. The ages of the Scotch firs, therefore, should be only one year transplanted, viz. three years old, larches and spruce firs, three and four years; and the hard wood kinds, three, four, and five years old, just to suit the situations which they are to be removed to, and the progress they have made in the nursery, always keeping in mind, that the smaller the trees, the sooner they will get footing in the ground and shoot up.

In land of a poor quality, such as mine, the kinds of trees, proper to be first planted, may be as follows, viz. larches one fourth, Scotch firs the same, and the rest of the ground filled up with birches, alders, oaks, ashes, and elms, in such proportions as the ground may direct, by being of a moist or dry quality, &c.

I must now beg leave to mention, that a practice prevails very much in good soils, of cutting the grass in plantations, either for some needy cottagers cow, or, from an idea of its hurting the trees, which method, I always oppose with all my might, being fully of opinion, that trees, in an infant state, receive great benefit from the shelter, and that infinitely more are destroyed by the hook, than by the weight of grass lying upon them, which will in general only injure a few larches and firs, where it is coarse, and the land wet, for want of draining.

In answer to that part of your letter, relative to the propriety of cultivating ground, before planting, by trenching, digging, or ploughing, I must say, that it certainly has a good effect to follow some of those schemes, on clayey bottoms, or in such ground as inclines thereto; and, it is a farther advantage, to keep it pretty clear after being planted, by introducing amongst the trees a crop of

potatoes, and hoeing it for two years after; but all this latter treatment is supposed to be in the most ornamental parts of pleasure grounds, and probably on land of no very great extent. But with respect to such a subject as mine, I am pretty certain, so much expense in digging or ploughing may be saved, and the trees thrive equally well, as I see no progress that they have made where the ground was ploughed, more than in that which was planted in its natural state amongst the wild native heath; and although several acres were trenched, I think the principal advantage which the trees have gained, is in part owing to the superior goodness and depth of soil, where such trenching has taken place, and from being made sheltered. But notwithstanding what I have advanced, I have seen, particularly in the north of Scotland, very bad land that would receive infinite benefit if it was ploughed or trenched so deep as to perforate a close stratum of hard substance, so retentive as to hold water like a dish, and which if not broken, will never permit the roots of the trees to descend below it; consequently, for want of this precaution and necessary expenses, they are frequently blown down long before they arrive at maturity. In general, this obdurate substance is within reach of the plough, but sometimes deeper, and runs through very large tracts of country, like any mineral substance.

I have before mentioned, that all the trees were planted here in holes made with a hollow spade, but larches and firs are often put in, by other persons, by making two slits with the common spade, so as to form two sides of a square, and after lifting up the sod, which of course is fast on the other two sides, treading it down upon the plant; this is much sooner done than by digging holes, and in very light and sandy soils, where it is an advantage
to

to disturb the surface as little as possible, this method does very well.

I am happy to have it in my power to answer your letter relative to the value of the wood when cut down, by stating, that last year I took an under-rated average of the growing timber, which made each acre to contain 480 trees, and each tree one cubit foot and three quarters of wood, the value of which at the low price of two shillings per foot, would amount to £84 sterling an acre, exclusive of the bark, which at the present price of eleven guineas per ton, is equal to a third part of the timber, supposing the trees were all larches :—In this estimation some of them did not contain above one foot, whilst others measured eight, ten and twelve feet, and which are growing upon land that only cost one and two guineas an acre, and in order to find out pretty correctly the progress that larch trees make, which we formerly thought would double their size every eight years, I selected six which were from fifty to sixty feet high, and measured the contents by the circles each year's growth produces, and the following was the result.

At ten years old, every tree was supposed to consist of one part ; at thirteen years and a half the average area of each section was twice as much ; at eighteen years four times as much ; at twenty-five years and one quarter, eight times as much ; and at thirty years old, when they were cut down, twelve times as much, as at ten years old, which therefore doubled their growth every six years, and six other trees I took an account of at Lindertis, in the county of Angus, (whilst employed there a year ago in my profession of laying-out grounds) and which grew upon much better soil than mine, measured as follows, (viz.), from ten to thirteen years and one quarter, they were twice the size ; at
eighteen

eighteen years and three quarters, four times as much ; at twenty-five years and three quarters, eight times as much ; and at thirty-three years and one quarter, when cut down, they were twelve times as large as at ten years old ; so that in twenty-three years and one quarter they doubled themselves three times and one half, (viz) every six years and three quarters. And in order to shew how very correctly this mode of calculation agrees with the measurement of living trees, I have for some years back kept an account of several larches, which I numbered for the purpose, taking the girth at six feet from the ground, seven of which trees in the winter 1809, contained 17ft. 2in. 6 eighths. and, at the end of the two following years, their measurement was 22ft. 1in. 9eighths. since which period they and several others have increased pretty much about the same ratio ; but as the said trees are every year adding to their height, the increase is evidently more than what I have stated.—From the best information I can obtain to the enquiry you make about the elevation of Woodlands above the sea, and the distance from it, the former is six hundred feet, and the latter twenty miles.

In regard to the question you ask, about what time these plantations were first thinned ? I think it would probably happen ten years after planting, but this business always depends upon the progress of the trees, which in sheltered situations will require the axe sooner ; and the true guide to ascertain the number to be taken out each time, is, to free every tree that is to remain from the lashes of its neighbour's tops, weeding out the worst first, and always keeping in mind which trees are to stand ultimately.

In a country where hedge-stakes are wanting, or fuel
scarce,

scarce, which this work consists of, the expense will nearly be paid.

The second thinning took place about eight or ten years after, or at eighteen years growth, being as soon as the trees began to touch each other again; which produce was found useful for coal baskets, pit props, and crate-wood, as used in glass-houses, besides being of service for many purposes in the lead-mines, &c. &c. this therefore not only paid the expense, but began to make some return for the original cost of planting the trees, &c. At the end of the next six or eight years, when they began to annoy each other again by their proximity, many were large enough for buildings, in addition to the uses before alluded to; and at the next thinning, which is now going on, I sell them as rails for coal-waggon to run on, for timbering and flooring larger buildings, for fence railing, &c. and the larch, which I am happy to say rises in estimation daily, is not only used by others in the great variety of ways before-mentioned, but by myself for some works in husbandry, where ash was before resorted to, viz, for making the entire bodies of waggons, and even blocks and poles, where the greatest toughness is required to carry heavy burthens.—These waggons possess both lightness and durability, and answer perfectly well. I also find the larch to remain sound in the ground, when the small sized oak which is laid near it, and at the same time, as the bottom rail of a coal-waggon way, is going to decay, which perfections are in wood that will attain much greater strength as the trees increase in size.

This last thinning is supposed to leave the trees at timber distances, viz, 12, 15, and 18 feet asunder, which I think far enough to allow larches to arrive at large dimensions; whose roots, when each tree is allowed sufficient room,

room, will occupy as much extent below ground as the branches do above.

With respect to your observations about pruning, I see it so very often put in practice, upon hundreds of trees that ought to be cut down, and so wretchedly performed where it might be of use, that I am afraid more mischief has been done than good by the application of it, exclusive of the large sums thrown away ; which makes me almost regret that so much has been written about it. I will, however, according to your desire, copy a few observations written by my late father, to a friend, a year or two before his death, on this subject, and that of shelter.

Pruning.

“ Though much has been said against it, I must observe, that no planted wood can be made clear and brought to perfection without it, as trees properly planted and thinned will, by the room allowed, put out large branches, which, if left on, will in a timber state become great knots, and in the fir tribe in particular will make the timber of little value, and unsuitable for many purposes ;—certain it is, that this work is often performed very improperly, so as to prevent the growth of the tree, by divesting it of too many branches, and thus injuring the circulation of the sap, for which purpose the foliage of the tree is by nature intended.”

“ Others in pruning, leave stumps standing out several inches from the stem, which when cut, die of course, and will remain on the tree till its annual growth laid on in circles, covers the whole ; and when the tree arrives at timber, and is sawn up, the dead knots fall out, leaving a
hole

hole in each plank, which the workmen call dead knots: the method, therefore, which I should recommend is, to begin to prune some little time prior to each thinning, that the woodman may see more clearly what trees are to be taken down, at which time the branches of the fir kind will be small, and the knots consequently so; and those of the larch may be covered with a sixpence.

“To prevent dead knots, the amputation should be performed close to the stem, which will heal in a very short time.

“The subsequent prunings may keep pace with the thinnings, it being a bad mode to defer that work, till the branches become large, or to do too much at one time; and regard ought always to be paid to leave a handsome top, which should be about two-thirds of the whole height.

“These prunings, as well as the tops of the trees taken down, after they have laid a year or two, upon the land, completely banish the wild native heath, and bring up white clover, and other general grasses, which, added to the annual droppings of the larch, and other trees, have, in the course of twenty or thirty years, a good effect in deepening the soil, and preparing it for vegetation.”

Shelter.

“This article I conceive to be of so much importance as not to be omitted, which is as essential to the growth of trees as the soil that produces them; as the greater the mass together, the quicker they will grow, particularly in such situations where nature has not provided shelter; which must appear evident by comparing rows, clumps, and

and small plantations, with extensive woods of the same ages; and as the west wind in all parts of this island is more prevalent than any other, there should be always in that quarter a formidable screen of the hardy resinous trees, such as firs and larches, which should be pruned no higher than the wall or hedge that surrounds them; and the article of thinning should only be so performed on that side as to prevent their growing into poles, which would divest the wood of that shelter you wish to encourage. In short, the western border should be so managed, as to make it subservient to the good of their more protected and prosperous neighbours; indeed, they will, by their slow growth to the west, require less pruning and thinning, for so severe is this wind upon trees, that even upon the eastern shore they lean from the west."

The orchard of eleven acres which you mention in your letter, I am sorry I cannot give so good an account of; for, although the trees were planted facing the south, with large masses of wood all round, as the ground sloped quickly, it was rather too much exposed to the east and west winds, but particularly the latter, which came sweeping up the valley before the forest trees were high enough to protect them; which defect, in addition to the injury some of the fruit-trees received in our absence, from the plough, both on their bark and roots, by careless drivers, induced us to take up the best trees, and plant them, large as they were, on a smaller scale, and on a spot more level and perfectly sheltered, where they are now producing very well. But in this northern climate, where we are very liable to untoward springs, fruit trees are often severely handled by frosts, which come on so very late, as to make the produce very precarious, and to injure very much even the tender leaf of the larch, as well as other forest

forest trees ; it is therefore almost impossible to have an orchard, too much sheltered by lofty hedges, rows of trees, &c. which are the only true ways to avoid disappointment, and chagrin at the yearly loss of your fruit ; as an example of the good effects of which, I know a cottager's orchard made out of an old gravel pit, so sheltered by hedges, bushes, and trees, as scarcely ever to fail, notwithstanding the barrenness of the soil.

Our late agent, West, whom you mention, and was a most clever active man, died twenty years ago. However, I flatter myself, that any information he could have given relative to these plantations, I have, from my long residence on the spot, been able to detail pretty correctly.

It is with very great pleasure indeed, that I answer your questions, whether the bark of the larch continues in favour with the tanners ? one of whom, a customer of mine, who deals very extensively in the trade, has not, I believe, used much oak-bark this season, and probably will not, should the supply of larch be sufficiently abundant.—He finds such advantage in the beautiful light colour of the leather, as well as in the process being shortened, by the larch tanning quicker than the oak-bark, that I think his neighbours in another year will try to have a greater share in the advantage of using this substitute.

I take every method of trying leather tanned with it, and it has never once induced me to have a worse opinion of it than I at first entertained.

At the time I began tanning with larch bark, I tried Spruce and Scotch fir, Weymouth pine, and some other barks, all which I found would tan in a certain degree, but which were of very little comparative value with the larch ; and as I supposed the weakness of the fir tribe in
its

its timber, would be rendered still more so by taking off the bark, I have lately had an opportunity of proving it, and see that one year after, if the wood is exposed to the weather, it is perfectly unfit for any purpose but the fire, by shewing evident signs of decay ; but, notwithstanding this great defect, as my first experiment in tanning with fir bark was only very limited, I was determined, on being requested by Mr. Stobbort, of Hexham, to try it, to do so on a larger scale against larch bark, which, at first appeared to advance pretty equally, but I now find the leather in the larch-pit perfectly done, and that in the other will require as much more time, besides almost double the quantity of bark. As I mention the tanning quality of fir bark, I must also give a comparative statement of the expense of collecting it. Each Scotch fir affords little more than half the quantity of larch of the same dimensions, and takes nearly double the time in peeling, which brings the expense to be almost fourfold that of the larch ; as that is the case, and almost double the quantity of bark is necessary to tan the same weight of leather, it can only be an object to be resorted to on the greatest emergency, when little or nothing else can be got, and where it can be collected from wood that is only wanted for firing, as no prudent person would think of destroying his timber for the scanty supply of bark which a fir will afford.

The eleven guineas per ton, which I received last year for larch bark, I only demand this, in order to encourage the use of it ; but its true value many farmers have now the candour to say is little inferior to oak bark.

Before I conclude this subject, I must beg leave to add, that, notwithstanding the great extent of plantations made within fifty years in Great Britain, unless the proprietors of land turn their attention to their increase, by
filling

filling with trees, every part not convertible to useful tillage, the produce of bark will never do away the necessity of importation ; as it requires such a surface of ground to go over, to meet the yearly consumption, as is almost incredible.

And it is a matter of great regret, that within the period mentioned, numbers of them are going fast to decay, from a want of being thinned soon enough, and in a proper manner ; which no planter can now have an excuse for neglecting, when the tanner holds out to him, in almost every town, a sure return for his trouble and expense, in addition to the incalculable advantage of permitting the remaining trees to double themselves in value, every six or eight years, which they can only do by a liberal use of the axe.

I am,

Sir,

Your most obedient, humble Servant,

THOMAS WHITE.

To C. TAYLOR, M. D. SEC.

Society of Arts, &c.

FIFTEEN GUINEAS were this Session voted to Mr. JOHN TILLEY, of Whitechapel, for an *Hydro-pneumatic Blow-Pipe for the Use of Chemists, Enamellers, Assayers, and Glass-Blowers*. The following Communication was received from him, an explanatory Engraving is annexed, and the Machine is preserved in the Society's Repository.

SIR,

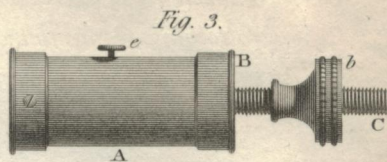
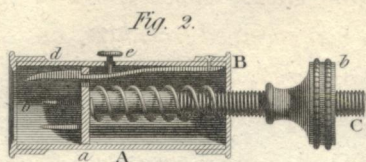
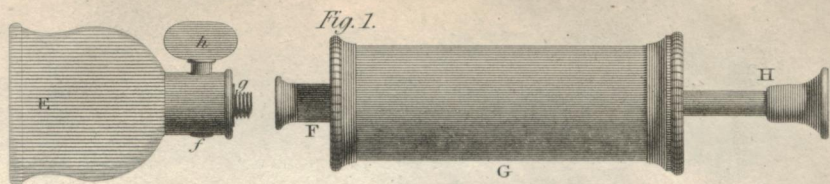
BEING a travelling fancy glass-blower, I work with a Machine which I have contrived for my own use, and which I have been advised, by a great number of respectable gentlemen, to lay before the Society of Arts, &c. The invention consists of a tin-box, with a partition in it reaching from the top at one end to within an inch of the bottom. The vessel is air-tight at this end, It is three parts filled with water. By means of a tube reaching within half an inch of the bottom, I blow into the water at the air tight end; the air rises in bubbles through the water to the top, and forces the water under the partition into the other compartment. The weight of the water acts upon the air which had been blown in, and forces it through a blow-pipe directed to the lamp, and keeps up a continued blast till the air is exhausted. More air may be blown in from time to time, so as to keep the blast regular and continual. It is thus I execute my fancy glass-blowing. The whole apparatus, including lamp and case, weighs only three pounds and a half.

I believe I am the first glass-blower who ever worked with such a Machine.

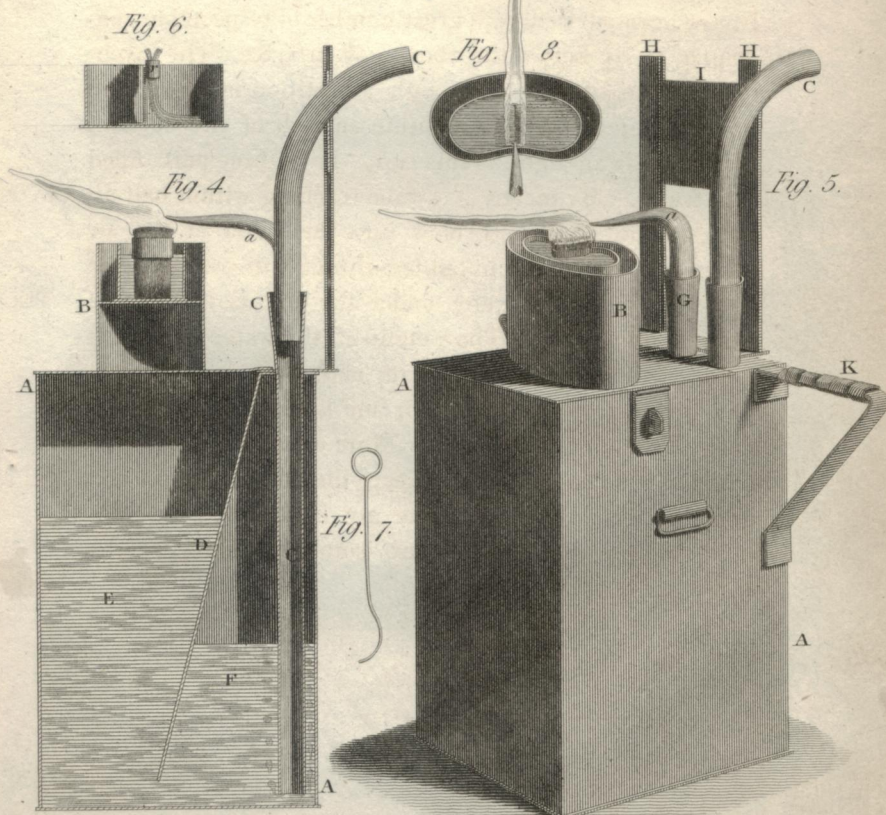
If

M^r. J. Whitford's mechanical substitute for Leeches.

Pl. III.



M^r. John Tilley's Hydro Pneumatic Suction-pipe.



Drawn by J. Earey.

*Engraved by J. Bacon.
27 Peter Lane.*

If the Society should think me deserving of any reward,
it will be very thankfully received by,

Your obedient humble Servant,

JOHN TILLEY.

Direct for me at Mr. Thomas Yandall's, bookseller, Old
Street Road, near Shoreditch Church.

The apparatus is applicable to the business of enamellers, jewellers, chemists, and many other arts, and can be furnished complete for £2 12 6, made of tinned copper.

March 27, 1812.

To C. TAYLOR, M. D. SEC.

*Reference to the Engraving of Mr. Tilley's Hydro-pneumatic
Blow Pipe.*—Plate 3. Fig. 4, 5, 6, 7, 8.

THE utility of the blow-pipe, in the arts, to raise a great heat in a small object, from the flame of a lamp, is too well known to require pointing out. The assay of minerals, the arts of enamelling, jewellery, soldering metal works, but above all, the blowing of small articles in glass, are purposes to which it is better adapted than almost any other mode of applying heat. The usual manner of producing a stream of air for blowing glass, is by means of a small pair of double-acting bellows, fixed beneath a table, and worked by the operator's foot; a pipe proceeds from these bellows to the top of the table, and terminates in a small jet, before which a lamp is placed, and the flame blown by the current of air upon the object to be heated. The defects of the bellows are, that the stream of air is not perfectly regular, which causes a wavering of the flame, so that it does not fall steadily upon the object which is to be heated. Mr. Tilley's blow-pipe corrects these defects, by using the pressure of a column of water to regulate the

stream of air, and the supply is furnished from the mouth of the operator, by blowing through a tube, fig. 4, C, at a section of this instrument, and fig. 5 shews a perspective view of it in action. A A, is a vessel of tinned iron, or copper, about 17 inches high, 5 wide, and 9 broad; the lid of which opens and shuts on hinges, and supports the lamp B, which burns tallow instead of oil. C is the blowing-pipe, by which the air is thrown into the vessel; this, as shewn in the section fig. 4, has an inclined partition D, which divides it into two chambers, E and F; but as the partition does not reach to the bottom of the vessel, the two compartments communicate with each other underneath it: that marked F, is closed at the top so as to be air-tight; but the other is only covered by the lid of the vessel, and may therefore be considered as being open to the outward air. The pipe C, fig. 4, is soldered air-tight, where it passes through the top of the chamber, and descends very near to the bottom of the vessel, deeper than the partition D does, so that its mouth is always immersed beneath the water. The metallic part of the blow-pipe G, which conveys the blast of air to the flame of the lamp, is likewise soldered into the top of the chamber F, it holds a bent glass tube, *a*, which terminates in a very small and delicate jet, and is fitted air-tight into the tin or copper tube G. Now, by blowing into the tube C, the air is forced out at the bottom of it, and rises in bubbles through the water into the upper part of the chamber F; this displaces a corresponding quantity of water, which passes under the partition D, into the other chamber E, elevating the surface of the column of water, and depressing the other, as shewn in the figure; the water endeavouring to return to its original level, causes a constant compressure of the air, and forces it through the jet *a* into the flame of

of

of the lamp. By this means, it is not necessary to blow constantly with the mouth; for, though the air is forced into the receiver at intervals, yet the pressure of the water will expel it in a constant stream, and the operator will not be fatigued by the motion of the foot, necessary in working bellows, nor need even to keep his mouth at the pipe constantly, but merely to blow from time to time, as he finds the stream of air to decrease in its power.

The metal socket which connects the glass tube or blow-pipe *a* with the vessel *A*, is made conical, and the tube, having a piece of paper first wrapped round it, is bound round with cotton-wick yarn in a conical form, so as to fit the socket tight, and yet permit the tube to be moved in any required direction, to cause the air to act properly upon the flame; and the curved metal tube *C* is also fixed into the upper part of the tube *C* in the same manner. *H H* are the two sides of a tin frame, which is fixed in front of the vessel, and has grooves withinside of them to receive a tin plate *I*, which forms a screen, and can be adjusted in height so as to keep the light of the lamp from the operator's eyes, though he can see the work over the top of it: this screen is held fast by its foot being placed between the lid of the vessel and the top of the close chamber *F*. *K* is one of two handles, which support the operator's arms whilst holding a glass tube or other matter in the flame, and there is another like it at the opposite side of the vessel: these handles are also wrapped round with woollen list or leather, so as to form cushions; and the vessel is steadily fixed upon a chair, bench, &c. by means of a leather strap buckled to the loops on each side of it, and passing under the chair, &c.

The lamp is made of tin, is of an elliptical, or rather of a bean or kidney shape, one side being carved inwards;

across the centre of it stands a metal wick-holder, having a loop on one side of it, and which is soldered to its bottom, (see *r*, fig. 6.) Through this loop the wick of cotton is drawn, and being opened both ways, as shewn in that figure, and still plainer in fig. 8, forms a passage in its middle, through which the current of air from the jet *a* passes, as in figs. 4 and 8, and carries the long pointed flame upon the object to be heated. The lamp, figs. 6 and 8, is filled with tallow, which, melting by the heat, becomes fluid, and burns as well as oil, but with a less offensive smell, and when cold, being solid, is more conveniently carried than oil. This lamp is placed within another vessel marked B, figs. 4, 5, and 8, which supports it at a proper height, leaving a space between them all round, to receive any tallow which may run over the edge of the interior vessel or lamp.

In using this blow-pipe, the following observations being attended to, will greatly increase its effect. The long flat cotton wick of the lamp will be found to act better than the usual round cotton wick; but in either case, the flame which it raises will be considerable. The end of the glass pipe *a* must be just entered into the flame, and the current of air will throw out a cone of flame from the opposite side. If it is well managed, this cone will be distinct and well defined, and extend to a considerable length. Care must be taken, that the stream of air does not strike against any part of the wick, as it would then be disturbed, and the cone split into several parts. (A wire bent at its end, as shewn at fig. 7, is very convenient to smooth the passage through the wick :) the jet of air must be delivered somewhat above the wick; and as, unless the flame was considerable, there would not be sufficient for the stream of air to act upon, for this reason the wick is
opened,

opened, as shewn in fig. 6, that it may expose the largest surface, and produce the greatest flame ; the stream of air from the pipe should be directed through the channel or opening between the wick, so as to produce a cone the most perfect and brilliant. On examining this cone of flame, it appears to be formed of two different colours, the part nearest to the lamp being of a yellowish white, and that beyond of blue or purple colour.

The subject which is to be heated, is held in the flame at the termination of the yellowish-white flame, where it receives the greatest heat, and is not discolored by the soot which accompanies the white flame.

Glass tubes are, when applied to this flame, quickly rendered pliable, and may be bent or drawn out into threads or points, and hermetically sealed; or, by blowing into the other end of the tube, it may be expanded into a small globe, so as to form various small articles at the pleasure of the operator.

In chemistry, mineralogy, and the arts, the blow-pipe is an extremely useful instrument, being capable of throwing such a powerful heat on a small object, as would be difficult to obtain on a larger quantity of the same substance, in the most powerful furnaces : and with this advantage, that the process is always under the inspection of the operator ; whereas he can only conjecture what passes in the centre of a furnace.

In using the blow-pipe for experiment, a piece of charcoal is generally used to support the subject, and held in the flame of the lamp ; the charcoal should be of a close compact grain, and properly burnt ; for, if it is too little carbonised, it will flame like a piece of wood, and obscure the object ; and if it is too much burnt, it is so quickly consumed, and burnt to ashes, that the object is in

danger of being lost in it; the charcoal greatly increases the heat, by reverberating the flame, and by heating the object at the opposite side; itself being converted into fuel, and excited by the blast, and thus creates an atmosphere of flame and heated air around it, which prevents the heat being carried off so fast, or the object being so much cooled, as if it should for an instant be moved out of the cone of the flame, from the unsteadiness of the hand, or from accidental currents of air, which would disturb the flame, and cause such a wavering in the point of the cone, as to divert it in some measure from the object. In order to prevent more tallow than is necessary from being consumed, to produce the intended effect, it is convenient to have several lamps with wicks of different thicknesses, viz, one to hold two flat cottons, (such as are used for the Liverpool lamps) of about $1\frac{1}{2}$ inches broad; another to hold four, and a third to hold six, or as much common wick yarn, as is equal to those wicks in bulk, glass jets should also be provided of different sized apertures, to suit the greater or lesser sized wicks and flames, and deliver streams of air upon them proportionately, and their jets should point upwards in a small degree: hogslard is also equal or perhaps superior to tallow for the lamp.

TEN GUINEAS *were this Session presented to Mr. CHARLES DRURY, of Mansfield, Nottinghamshire, for making an useful Paste from Potatoes for Weavers, Bookbinders, Trunkmakers, Upholsterers, &c. The following Communications were received from him.*

SIR,

PERMIT me to lay before the Society of Arts, &c. a substitute for wheat flour paste. I have given it a fair trial for ten months past, in order to convince myself and others of its usefulness. From these experiments, I have no doubt it will prove equal, if not surpass that made from flour, for paper-hangers, stationers, weavers, trunk-makers, callico-printers, &c. and also for labels, cards, and pasteboard, as it may, with ease, be made free from lumps, and does not admit the air to get under the paper as in common paste, or injure the colour. It is free from any offensive smell, and not above one-third of the price of that prepared from flour. The use of potatoe paste will cause a saving of many thousand bags of flour annually, to be applied to the nourishment of mankind.

One peck of potatoes, when prepared, will make upwards of thirty eight pounds of paste, and one acre of land planted with potatoes, would produce more than many acres of wheat. I shall be happy to attend, and give the Committee full explanation upon the subject.

I remain, Sir,

Your most obedient, humble Servant,

CHARLES DRURY.

Mansfield, May 1st, 1812.

To C. TAYLOR, M. D. SEC.

Process for preparing Mr. Drury's Paste from Potatoes.

Take one pound of raw potatoes, well washed from dirt, grate them fine on a common tin grater, without paring them, into two and a half pints of water, then boil the whole mixture immediately, and stir it well during the whole time of boiling, which should be about two minutes, then remove it from the fire, and add to it half an ounce of finely powdered allum, by gradually sprinkling it into the paste, and stirring it with a spoon, till the whole is perfectly incorporated. It will then be fit for use, and forms a beautiful transparent paste.

*Letter from SIR JOHN SINCLAIR, Bart. President
of the Board of Agriculture.*

DEAR SIR,

This will be delivered to you by Mr. Charles Drury, whose mode of making Paste seems entitled to the attention of the Society of Arts, &c.

I remain, dear Sir,

Your very obedient Servant,

JOHN SINCLAIR.

27, Old Burlington street,

May 29, 1812.

TO C. TAYLOR, M.D. SEC.

Certificates were received from Mr. Richard Free, Trunkmaker, 115, High Holborn; Mess. J Viney & Co. Trunkmakers, 122, Aldersgate Street; and Mr. F. Clark, Bookseller, 55, Piccadilly; all stating Mr Drury's potatoe paste to be equal to that made with flour, and that, after being made ten or twelve days, and exposed to the air, it did not appear to be in the least changed.

* * Mr. Whately's machine, see Plate 1, for reducing potatoes to a pulp, would be found highly advantageous to use where a considerable quantity of potatoe paste is made.
